Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Guiding-centre and full-Lorentz orbit solving in 3D magnetic coordinates for fast particle simulations WILFRED A. COOPER, DAVID PFEFFERLE, JONATHAN P. GRAVES, Ecole Polytechnique Federale de Lausanne (EPFL), Centre de Recherches en Physique des Plasmas (CRPP), CH-1015 Lausanne, Switzerland — Designed to accurately solve the motion of energetic particles in the presence of 3D magnetic fields, the VENUS-LEVIS code leans on a non-canonical general coordinate Lagrangian formulation of the equations of motion. It switches between full-orbit particle following and guiding-centre tracing by verifying the perpendicular variation of magnetic vector field, not only including gradients and curvature terms but also the shearing of field-lines. The criteria is particularly relevant for the study of fast ion redistribution in the kinked core of hybrid plasmas, where the compression of flux-surfaces against the axisymmetric outer mantle creates strongly varying magnetic field-lines and large parallel currents. Slowing-down simulations of NBI fast ions show that co-passing particles helically align in the opposite side of the plasma deformation whereas counter-passing particles are barely affected by the kinked structure. Results are compared with experimental neutron camera traces and FIDA measurements during long-lived modes (LLM).

David Pfefferle
Ecole Polytechnique Federale de Lausanne (EPFL),
Centre de Recherches en Physique des Plasmas (CRPP),
CH-1015 Lausanne, Switzerland

Date submitted: 11 Jul 2014 Electronic form version 1.4